4.0 DISCHARGE LISTINGS

The results of the aerial and boat surveys are summarized by segment number and presented in the appendicies. The data listings and site documentations are from the combined data bases of permitted sites, aerial observations, and surface observations. Permitted discharges are listed first in each segment and the unpermitted discharges discovered during these surveys follow. Photographs of the unpermitted discharge sites (both aerial and shoreline perspectives where possible) follow the unpermitted listings. Photographs are identifiable to the respective unpermitted site by the GBNEP number and the S/O or A/O number shown on each photograph and listed in the data files.

Photographs were taken and catalogued for each permitted site as part of the investigation but are not included as part of this report. Approximately 575 photographs were recorded and filed in the working documents used in performance of this study. These photographs are identifiable to the respective permitted sites by the GBNEP number and A/O number associated with each file entry and photograph.

The number and type of Permitted and Unpermitted Discharges annotated in this study are summarized in Table 4.1 and 4.2. The percentage of discharge structures located by the aerial, boat, and both type surveys are listed by segment (and hence shoreline type) in Table 4.3.

Table 4.3 shows the percentage of discharge structures located solely by the aerial survey, solely by the boat survey, and by both survey methods for both permitted and unpermitted discharges. Some permitted discharges were not located (due to being outside study area, e.g. offshore sites, etc.), these sites were excluded from inclusion in Table 1.

The percentage of both aerial and boat survey locating a permitted discharge ranges from 0 to 100%. At one end of the spectrum is Carancahua Bayou which was only accessible by the air, while four other segments showed complete confirmation. For Galveston Bay, segment 2421, the boat survey was critical for identifying discharge sites due to the high degree of development.

The proportion of unpermitted discharges located by both methods ranged from 0 to 73%. As with the permitted sites, highly developed areas (e.g. segment 2421) are highly dependent on boat surveys.

Table 4.1. Types of Permitted Discharges

Segment Description	Oil Related	Chemical Plant	Sewage Discharge	Power Plant	Unknown & Misc.
901	6	4	4	1	1
2421	2 (18)	2	6	1	0
Double Bayou	0	0	2	0	1
2423	5 (4)	0	1	0	0
1107	3 (1)	2	2 (3)	0	1
1113	2	2 (1)	1 (2)	0	2 (2)
1103	9	1	3	0	2
Carancahua Bayou	3	0	0	0	0
Total	30 (23)	11 (1)	19 (5)	2	7 (2)

Values in parentheses are sites outside study area but within segment.

Table 4.2. Types of Unpermitted Discharges

Segment Description	Storm Drains	Dredge Spoils	Oil Related	Lawn Drainage	Sewage Discharge	Unknown & Misc.
901	8	3	1	0	1	6
2421	8	0	0	14	1	8
Double Bayou	1	0	1	0	3	4
2423	2	0	0	0	0	5
1107	3	3	0	0	2	6
1113	7	0	2	0	0	1
1103	11	0	1	1	1	10
Carancahua Bayou	0	0	3	0	0	0
Total	40	6	8	15	8	40

Table 4.3. Percentage of Discharge Structures located by Aerial, Boat, and Both Survey Methods.

	UNPERMITTED DISCHARGES			PERMITTED DISCHARGES		
SEGMENT	AERIAL OBS ONLY (%)	SHORE OBS ONLY (%)	BOTH AERIAL AND SHORE (%)	AERIAL OBS ONLY (%)	SHORE OBS ONLY (%)	BOTH AERIAL AND SHORE (%)
901	0	42	58	11	0	89
2421	0	97	3	13	38	59
DOUBLE BAYOU	0	60	40	0	0	100
2423	14	29	57	0	0	100
1107	7	20	73	17	0	83
1113	30	50	20	0	0	100
1103	33	54	13	45	0	55
CARANCAHUA BAYOU	100	0	0	100	0	0

4.1 Cedar Bayou: Segment 0901

This segment encompasses 19 river miles through an industrialized/urban tributary. The upper reaches of the Bayou are fairly inaccessible by boat, and there were no boat launch ramps except at the bay end. Numerous large permitted facilities discharge into this segment, and there is considerable dredging activity at the lower reaches. Permitted and unpermitted discharges documented in the survey for this segment are summarized in Table 4.4

Table 4.4. Summary of Discharges for Cedar Bayou: Segment 0901

GBNEP #	PERMIT	DISCHARGE TYPE
1	YES	UNKNOWN/MISC.
2	YES	OIL RELATED.
3	YES	OIL RELATED.
4	YES	OIL RELATED.
5	YES	OIL RELATED.
6	YES	OIL RELATED.
50	YES	SEWAGE.
51	YES	SEWAGE.
52	YES	OIL RELATED.
53	YES	CHEMICAL PLANT.
54	YES	CHEMICAL PLANT.
55	YES	POWER PLANT.
56	YES	CHEMICAL PLANT.
57	YES	CHEMICAL PLANT.
58	YES	SEWAGE.
59	YES	SEWAGE.
183	NO	DREDGE SPOILS.
184	NO	POSSIBLE STORM DRAIN.
185	NO	UNKNOWN/MISC.
186	NO	UNKNOWN/MISC.
187	NO	POSSIBLE STORM DRAIN.
192	NO	POSSIBLE STORM DRAIN.
200	NO	OIL RELATED.
201	NO	SEWAGE.
202	NO	POSSIBLE STORM DRAIN.
238	NO	DREDGE SPOILS.
239	NO	DREDGE SPOILS.
240	NO	UNKNOWN/MISC.
241	NO	POSSIBLE STORM DRAIN.
243	NO	POSSIBLE STORM DRAIN.
244	NO	UNKNOWN/MISC.
245	NO	POSSIBLE STORM DRAIN.
247	NO	POSSIBLE STORM DRAIN.
248	NO	UNKNOWN/MISC.
249	NO	UNKNOWN/MISC.

4.2 Galveston Bay: Segment 2421

This segment encompasses 22 shoreline miles of wide open bay. Extensive residential development is essentially continuous along the length of this developed shoreline. The great fetch of water across the bay to the east and south requires careful consideration for the weather and prevailing winds and seas during survey periods. The boat must be seaworthy to endure this open water, yet shallow draft in order to get near the shore is necessary. The hundreds of private piers extending hundreds of feet into the bay make an expedient survey from the water doubtful. The numerous lawn and bulkhead drains also tend to confuse the discovery and reporting of unpermitted discharges. Extensive embayments, containing yacht harbors and marinas along the shoreline, pose special problems. Permitted and unpermitted discharges documented in the survey for this segment are summarized in Table 4.5

Table 4.5. Summary of Discharges for Galveston Bay: Segment 2421

GBNEP #	PERMIT	DISCHARGE TYPE
7	YES	OIL RELATED.
8	YES	OIL RELATED.
10	YES	OIL RELATED.
11	YES	OIL RELATED.
12	YES	OIL RELATED.
13	YES	OIL RELATED.
14	YES	OIL RELATED.
15	YES	OIL RELATED.
16	YES	OIL RELATED.
17	YES	OIL RELATED.
18	YES	OIL RELATED.
19	YES	OIL RELATED.
20	YES	OIL RELATED.
21	YES	OIL RELATED.
22	YES	OIL RELATED.
23	YES	OIL RELATED.
24	YES	OIL RELATED.
25	YES	OIL RELATED.
26	YES	OIL RELATED.
61	YES	SEWAGE.
62	YES	SEWAGE.
63	YES	SEWAGE.
64	YES	POWER PLANT.
65	YES	CHEMICAL PLANT.
66	YES	CHEMICAL PLANT.
89	YES	SEWAGE.
98	YES	SEWAGE.
102	YES	SEWAGE.
204	NO	UNKNOWN/MISC.
154	YES	OIL RELATED.
155	NO	POSSIBLE STORM DRAIN.
203	NO	POSSIBLE STORM DRAIN.
213	NO	POSSIBLE STORM DRAIN.
217	NO	POSSIBLE STORM DRAIN.
221	NO	POSSIBLE STORM DRAIN.
225	NO	POSSIBLE STORM DRAIN.
226	NO	POSSIBLE STORM DRAIN.
252	NO	POSSIBLE STORM DRAIN.
173	NO	SEWAGE.
210	NO	UNKNOWN/MISC.
169	NO	YARD DRAINAGE.
170	NO	UNKNOWN/MISC.
171	NO	UNKNOWN/MISC.
172	NO	YARD DRAINAGE.
205	NO	YARD DRAINAGE.
206	NO	UNKNOWN/MISC.

Table 4.5. Summary of Discharge for Galveston: Segment 2421

GBNEP #	PERMIT	DISCHARGE TYPE
207	NO	UNKNOWN/MISC.
208	NO	YARD DRAINAGE.
209	NO	YARD DRAINAGE.
211	NO	YARD DRAINAGE.
212	NO	YARD DRAINAGE.
214	NO	YARD DRAINAGE.
215	NO	YARD DRAINAGE.
216	NO	YARD DRAINAGE.
218	NO	YARD DRAINAGE.
222	NO	UNKNOWN/MISC.
223	NO	UNKNOWN/MISC.
219	NO	YARD DRAINAGE.
220	NO	YARD DRAINAGE.
224	NO	YARD DRAINAGE.

4.3 Double Bayou: Unclassified Segment in Chambers County

The segment survey covered 22 river miles of this agricultural rural tributary with oil field activity at the upper end of the east fork. The tributary splits into two branches near the bay entrance. The western fork is smaller and not navigable for much distance due to its narrow width and depth. The eastern fork is larger but not navigable past the last house on the bayou, as a large sunken boat blocks the stream. Further on, a small dam prevents boat passage. The upper reach of the area surveyed is surrounded by oil activity and rice farming, but is inaccessible by boat. Much of the bayou is overgrown almost completely with trees. This and the isolation from any crossing roads makes air survey of this portion the only practical method for survey. Permitted and unpermitted discharges documented in the survey for this segment are summarized in Table 4.6

Table 4.6. Summary of Discharge for Double Bayou

GBNEP #	PERMIT	DISCHARGE TYPE
87	YES	UNKNOWN/MISC.
95	YES	SEWAGE.
96	YES	SEWAGE.
133	NO	UNKNOWN/MISC.
134	NO	SEWAGE.
135	NO	OIL RELATED.
136	NO	POSSIBLE STORM DRAIN.
232	NO	SEWAGE.
233	NO	UNKNOWN/MISC.
234	NO	SEWAGE.
235	NO	UNKNOWN/MISC.
236	NO	UNKNOWN/MISC.
237	NO	UNKNOWN/MISC.

4.4 East Bay: Segment 2423

This segment includes 40 shoreline miles of wide open bay surrounded by agricultural and undeveloped open bay shoreline on the north and a few small marinas on the south, off the Intracoastal Waterway. Large expanses of shallow water and wetlands near the shoreline, and the wide open nature of the bay work against successful boat surveys for detecting discharges. The size, speed and seaworthiness of a boat required to cover the long distances (with no available shelter nearby) is not compatible with the shallow draft required to get near the shoreline. Also adding to the difficulty, is the expanse of wetlands on the south shore, with a myriad of channels, puddles, and streams which would hide most discharges from discovery except from above. Permitted and unpermitted discharges documented in the survey for this segment are summarized in Table 4.7

Table 4.7. Summary of Discharge for East Bay: Segment 2423

GBNEP #	PERMIT	DISCHARGE TYPE
27	YES	OIL RELATED.
28	YES	OIL RELATED.
32	YES	OIL RELATED.
33	YES	OIL RELATED.
34	YES	OIL RELATED.
35	YES	OIL RELATED.
36	YES	OIL RELATED.
37	YES	OIL RELATED.
93	YES	SEWAGE.
127	NO	POSSIBLE STORM DRAIN.
128	YES	OIL RELATED.
129	NO	POSSIBLE STORM DRAIN.
130	NO	UNKNOWN/MISC.
131	NO	UNKNOWN/MISC.
132	NO	UNKNOWN/MISC.
153	NO	UNKNOWN/MISC.
250	NO	UNKNOWN/MISC.

4.5 Chocolate Bayou: Tidal Segment 1107

This 14 mile segment of moderately developed rural tributary is the ideal setting for conducting a shoreline survey by boat. There are few significant tributaries which could contain hidden discharges. There are permitted facilities of major proportion, and smaller ones. There are not numerous storm drains to confuse the reporting, nor are the residential developments difficult to assess. Access is easy, almost in the middle of the segment, which is navigable through its length, and except for the bay at the south end, just about any small boat would suffice for surveying. Permitted and unpermitted discharges documented in the survey for this segment are summarized in Table 4.8.

Table 4.8. Summary of Discharge for Chocolate Bayou: Tidal Segment 1107

GBNEP #	PERMIT	DISCHARGE TYPE
47	YES	OIL RELATED.
48	YES	OIL RELATED.
67	YES	SEWAGE.
68	YES	SEWAGE.
69	YES	SEWAGE.
70	YES	SEWAGE.
71	YES	SEWAGE.
72	YES	CHEMICAL PLANT.
73	YES	CHEMICAL PLANT.
74	YES	UNKNOWN/MISC.
92	YES	OIL RELATED.
112	NO	SEWAGE.
113	NO	DREDGE SPOILS.
114	NO	DREDGE SPOILS.
115	NO	DREDGE SPOILS.
116	NO	UNKNOWN/MISC.
117	NO	SEWAGE.
118	NO	UNKNOWN/MISC.
119	NO	UNKNOWN/MISC.
120	NO	UNKNOWN/MISC.
121	YES	OIL RELATED.
122	NO	POSSIBLE STORM DRAIN.
123	NO	UNKNOWN/MISC.
124	NO	POSSIBLE STORM DRAIN.
125	NO	UNKNOWN/MISC.
126	NO	POSSIBLE STORM DRAIN.

4.6 Armand Bayou: Tidal Segment 1113

These 8 river miles, classified as a suburban tributary, are an enigma, as the shoreline and waterway itself are the most primitive or untouched areas of the entire study. The undeveloped bayou and shoreline are designated as a wildlife refuge and gasoline powered motors are prohibited for most of its length. Thus, two separate surveys, the second using the flat bottom boat and electric trolling motor, were required. Dense residential developments surround the bayou to the east and west. Discharges into the bayou were minimal, being mostly storm drains. Permitted and unpermitted discharges documented in the survey for this segment are summarized in Table 4.9

Table 4.9. Summary of Discharge for Armand Bayou: Segment 1113

GBNEP #	PERMIT	DISCHARGE TYPE
80	YES	UNKNOWN/MISC.
81	YES	CHEMICAL PLANT.
82	YES	CHEMICAL PLANT.
83	YES	UNKNOWN/MISC.
84	YES	SEWAGE.
85	YES	SEWAGE.
86	YES	SEWAGE.
90	YES	UNKNOWN/MISC.
91	YES	CHEMICAL PLANT.
94	YES	UNKNOWN/MISC.
176	NO	UNKNOWN/MISC.
177	NO	POSSIBLE STORM DRAIN.
178	NO	POSSIBLE STORM DRAIN.
179	NO	OIL RELATED.
180	YES	OIL RELATED.
181	YES	OIL RELATED.
182	NO	OIL RELATED.
227	NO	POSSIBLE STORM DRAIN.
228	NO	POSSIBLE STORM DRAIN.
229	NO	POSSIBLE STORM DRAIN.
231	NO	POSSIBLE STORM DRAIN.
246	NO	POSSIBLE STORM DRAIN.

4.7 Dickinson Bayou: Tidal Segment 1103 and Above Tidal Segment 1104

Tidal Segment 1103

This segment, extending 15 river miles west from its entrance into Galveston Bay, is described as a moderately developed suburban and rural tributary. At the bay end, the bayou is wide with large expanses of shallow water. Residential development is limited primarily to the north shore of the bayou. Oil field activity is primarily in the eastern portion and is not readily discernible from the shoreline. West of the highway 146 bridge there are large expanses of mud flats and shallow water which impede the boat surveys and limit access by water essentially to the main channel. The bayou narrows to a workable width two miles west of this bridge, and becomes increasingly narrow and shallower toward the non-tidal segment. The development along the shoreline and the trees overgrowing the bayou were sufficient that the entire bayou from 2 miles west of the highway 146 bridge to the highway 75 bridge required boat survey. Permitted and unpermitted discharges documented in the survey for this segment are summarized in Table 4.10

Above Tidal Segment 1104

Extending 7 river miles, this rural non-tidal tributary is only a very small stream which winds through agricultural fields with virtually no access to the stream bed. Few road bridges cross the bayou above the tidal segment, and from the air there appears nothing on the shoreline except a few drainage pipes which appear to drain rice fields. The stream is small enough to be jumped across in many places; thus, the only way to survey the shoreline from the ground would be to walk the entire length in the stream bed. Permitted and unpermitted discharges documented in the survey for this segment are summarized in Table 4.10

Table 4.10. Summary of Discharge for Dickinson Bayou: Tidal Segment 1103 and Above Tidal Segment 1104

GBNEP #	PERMIT	DISCHARGE TYPE
38	YES	OIL RELATED.
39	YES	OIL RELATED.
40	YES	OIL RELATED.
41	YES	OIL RELATED.
42	YES	OIL RELATED.
43	YES	OIL RELATED.
44	YES	OIL RELATED.
45	YES	OIL RELATED.
75	YES	CHEMICAL PLANT.
76	YES	OIL RELATED.
77	YES	UNKNOWN/MISC.
78	YES	SEWAGE.
79	YES	SEWAGE.
88	YES	UNKNOWN/MISC.
97	YES	SEWAGE.
138	NO	POSSIBLE STORM DRAIN.
139	NO	POSSIBLE STORM DRAIN.
140	NO	POSSIBLE STORM DRAIN.
141	NO	POSSIBLE STORM DRAIN.
142	NO	UNKNOWN/MISC.
143	NO	UNKNOWN/MISC.
144	NO	POSSIBLE STORM DRAIN.
145	NO	SEWAGE.
147	NO	OIL RELATED.
151	NO	POSSIBLE STORM DRAIN.
152	NO	UNKNOWN/MISC.
156	NO	UNKNOWN/MISC.
157	NO	POSSIBLE STORM DRAIN.
158	NO	POSSIBLE STORM DRAIN.
159	NO	POSSIBLE STORM DRAIN.
160	NO	UNKNOWN/MISC.
161	NO	YARD DRAINAGE.
162	NO	POSSIBLE STORM DRAIN.
163	NO	POSSIBLE STORM DRAIN.
164	NO	UNKNOWN/MISC.
165	NO	UNKNOWN/MISC.
166	NO	UNKNOWN/MISC.
167	NO	UNKNOWN/MISC.
168	NO	UNKNOWN/MISC.

4.9 Carancahua Lake and Bayou: Unclassified

This segment of 12 shoreline and river miles proved to be impossible to survey by boat within the scope of this study. A rural secondary bay with oil field activity, it was found through the aerial survey to be extremely shallow, swampy, and with a very circuitous route of the small bayou channel. The only access to the bayou and lake is through the lake entrance off the Intracoastal Waterway, northeast of Chocolate Bayou. The only vehicles observed in the area were all terrain swamp buggies being used by a seismic crew. A small flat bottom boat with oars and a small motor could likely be used in the lake, if it could be transited from its launching point miles down or across West Bay in any direction. Once in the lake, orientation and navigation would be extremely difficult as there are no features with which to reference one's position, and the land forms and true shorelines do not correspond to those shown on the map.

The aerial survey easily discovered the permitted discharges and other features identified as potential discharges. Confirmation on the ground with photographs and positional data proved impossible as access from the land would require transit across private property with locked gates. Almost all of the shoreline was devoid of any features which would draw interest as being a potential discharge. All of the discharges identified on the lake and bayou were related to oil field activity and were near described locations for existing permits. Without the aerial survey it is doubtful that even these permitted activities would have been discovered. A boat survey, if necessary, would require access across the private land and/or the use of two different type boats if it were to be approached from the lake. In either case, at least a day would be spent verifying essentially the absence of unpermitted discharges. Permitted and unpermitted discharges documented in the survey for this segment are summarized in Table 4.11

Table 4.11. Summary of Discharge for Carancahua Lake and Bayou

GBNEP #	PERMIT	DISCHARGE TYPE
46	YES	OIL RELATED.
60	YES	OIL RELATED.
105	YES	OIL RELATED.
106	NO	OIL RELATED.
107	NO	OIL RELATED.
108	NO	OIL RELATED.